CLAIMS

1. An implantable, temporospatially dynamic, rachiorthotic orthopaedics device comprising:

   - a unidirectional force generating means for generating a unidirectional force which acts over a range of deflection of said unidirectional force generating means;

   - a first attachment means for attaching said unidirectional force generating means to a first vertebra; and

   - a second attachment means for attaching said unidirectional force generating means to a second vertebra;

   wherein said unidirectional force is applied by said unidirectional force generating means via said first and second attachment means to said first and second vertebrae such that said first vertebra and said second vertebra are urged, over a period of time (which period of time extends beyond the end of a medical procedure to implant said orthopaedics device) and over a range of rotational, axial and/or flexional/extensional motion, towards a predetermined desired spatial relationship with respect to one another,

   whereby, over said period of time, said unidirectional force urges a proprioceptively neutral position of said first and second vertebrae towards a desired neutral position, and whereby a biological correction of a spinal deformity, spinal injury or other spinal disorder may be mechanically facilitated.

2. An orthopaedics device according to claim 1 in which said unidirectional force is insufficient to cause said first and second vertebrae to attain said predetermined desired spatial relationship at the time of implantation.

3. An orthopaedics device according to claim 1 in which the magnitude of said unidirectional force is in the range of 0N to 200N

4. An orthopaedics device according to claim 1 in which at least one of said first and second attachment means comprises a mobile joint chosen from the group consisting of a ball-and-socket joint or a hinge joint or a saddle joint or a pivot joint or a gliding joint or a condyloid joint.

5. An orthopaedics device according to claim 1 in which at least one of said first and second attachment means comprises:

- a base plate for fixation to a vertebra; and

- a connecting means for attaching said unidirectional force generating means to said base plate,

wherein said base plate is formed such that said connecting means can be connected at various locations on said base plate.

6. An orthopaedics device according to claim 1 in which at least one of said first and second attachment means comprises a plate for fixation to a vertebra, which plate comprises a plurality of connecting means for attaching said unidirectional force generating means to said plate at a variety of locations on said plate.

7. An orthopaedics device according to either of claim 5 or claim 6 in dependence on claim 4 in which said mobile joint is provided by an interface between said unidirectional force generating means and said connecting means.

8. An orthopaedics device according to claim 1 in which said unidirectional force generating means is at least partially formed out of a biocompatible, superelastic shape memory alloy, such as a Ni-Ti shape memory alloy.

9. An orthopaedics device according to claim 1 in which said unidirectional force generating means is a spring.

10. An orthopaedics device according to claim 9 in which said spring is a conventional, coiled spring which generates said unidirectional force by the application of torsional deformation perpendicularly on a coil or a plurality of coils of the coiled spring.

11. An orthopaedics device according to claim 9 in which said spring is a bending spring which generates said unidirectional force by the application of bending moments on curves of the bending spring.

12. An orthopaedics device according to claim 11 in which said bending spring comprises a length of elastic or super-elastic material shaped into at least one C- or S-shaped curve at at least one point along its length.

13. An orthopaedics device according to claim 9 in which said unidirectional force is generated by setting said spring in tension or compression between said first and second attachment points during the course of implantation.

14. An orthopaedics device according to claim 13 in which a plurality of said springs are provided such that a setting of the magnitude of said unidirectional force is achieved by appropriate pre- or intra-operative selection of a spring from said plurality of springs.

15. An orthopaedics device according to claim 13 in which at least one of said first and second attachment means comprises releasable clamping means for releasably clamping said spring to said first and/or said second attachment means, wherein said tension or compression is achieved through i) releasing said releasable clamping means, ii) mechanically applying said tension or compression and iii) clamping said releasable clamping means.

16. An orthopaedics device according to claim 13 in which at least one of said first and second attachment means comprises unidirectional gripping means which allow motion of said spring in relation to said attachment means in one axial direction of said spring, but prevent such motion in the opposite axial direction of said spring, wherein said tension or compression is achieved through pushing or pulling said spring through said unidirectional gripping means.

17. An orthopaedics device according to claim 13 in which said spring is at least partially formed out of a biocompatible, superelastic shape memory alloy, such as a Ni-Ti shape memory alloy wherein said setting of said spring in tension or compression is achieved through a martensitic or austenitic transformation in the shape memory alloy section of the spring due to a difference between the pre-operative temperature of said spring and the intra- and/or post-operative temperature of said spring.

18. An orthopaedics device according to claim 1 in which said unidirectional force generating means is arranged such that said unidirectional force drops to substantially zero in the proximity of a position at which said first and second vertebrae attain said predetermined desired spatial relationship.

19. An orthopaedics device according to claim 1 in which said unidirectional force generating means is shaped either at manufacture or intraoperatively to substantially conform to the shape of the portions of the surfaces of said first and second vertebrae over which said unidirectional force generating means passes.

20. An implantable, temporospatially dynamic, rachiorthotic orthopaedics system comprising a plurality of orthopaedics devices according to any of the preceding claims, wherein the orientation of the unidirectional force generating means of one of said plurality of orthopaedics devices may be set independently of the setting of the orientation of the unidirectional force generating means of at least one other of said plurality of orthopaedics devices.

21. An implantable, hybrid static/dynamic rachiorthotic orthopedics system comprising an orthopaedics system according to claim 20 and a rod or rods which may be attached in the place of at least one of said unidirectional force generating means by using at least part of said attachment means, whereby a choice may be made pre- and/or intra-operatively for each motion segment which is to be treated whether to apply static or dynamic methods.

22. An orthopaedic implantation kit comprising an orthopaedics device according to claim 1 or a system according to claim 20 and further comprising pre-operative planning means comprising of computer software which suggests appropriate orientation(s), points of attachment and/or force(s) for said unidirectional force generating means.

23. An orthopaedic implantation kit according to claim 22 in which said computer software utilises a finite element model of the spine in generating said suggestions.

24. An orthopaedic implantation kit according to claim 22 in which said computer software utilises data gathered from a digitised X-ray of vertebrae which are to be treated.